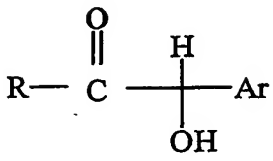
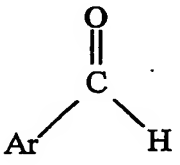
CLAIMS

1. A process of preparing an aromatic α-hydroxy ketone of formula (I)



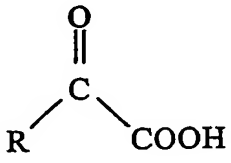
(I)

wherein R is H or C_{1-6} alkyl, and Ar is aryl, wherein said aryl optionally contains one or more heteroatoms chosen from N, S and O, and optionally consists of fused rings, and said alkyl and aryl are optionally substituted by 1 to 3 substituents chosen from C_{1-3} alkyl, C_{1-3} alkoxy, F, Cl, Br, I, OH, NH_2, CN, and NR_1R_2, wherein R_1 and R_2 can be independently H or C_{1-4} alkyl, and said C_{1-3} alkyl can be further substituted by a substituent chosen from F, Cl, Br, I, and OH; which process comprises reacting an aldehyde of formula (II)



(II)

with a 2-oxoacid of formula (III)



(III)

wherein Ar and R in formulae (II) and (III) have the meaning defined for formula (I); in the presence of a mixture comprising 2-hydroxy-3-oxoacid synthase chosen from AHAS and TSAS,

and thiamin pyrophosphate (TPP), flavine adenine dinucleotide (FAD), metal ions, and a buffer.

2. A process according to claim 1, wherein one of the enantiomers of the compound of formula (I) is formed in excess.

3. A process according to claim 1, wherein the aromatic α-hydroxy ketone is chiral aromatic α-hydroxy ketone.

4. A process according to claim 1, wherein the compound of formula (I) is (*R*)-arylacyl carbinol.

5. A process according to claim 1, wherein the 2-oxoacid is pyruvic acid.

6. A process according to claim 1, wherein the 2-oxoacid is chosen from glyoxylic acid, 2-ketobutyric acid, and 2-ketovaleric acid.

7. A process according to claim 1, wherein the aryl is chosen from phenyl, benzyl, naphthyl, furyl, pyridinyl and thienyl.

8. A process according to claim 1, wherein the aldehyde is a substituted benzaldehyde.

9. A process according to claim 1, wherein the aldehyde is benzaldehyde.

10. A process according to claim 1, wherein the compound of formula (I) is phenylacetyl carbinol (PAC).

11. A process according to claim 1, wherein the compound of formula (I) is (*R*)-PAC.

12. A process according to claim 10, wherein PAC constitutes more than 95% of the products of the enzymatic reaction.

13. A process according to claim 10, wherein PAC constitutes more than 99% of the products of the enzymatic reaction.

14. A process according to claim 11, wherein (*R*)-PAC constitutes more than 90% of PAC produced in the enzymatic reaction.

15. A process according to claim 11, wherein (*R*)-PAC constitutes more than 95% of PAC produced in the enzymatic reaction.

16. A process according to any one of claims 1 to 15, wherein said 2-hydroxy-3-oxoacid synthase comprises an enzyme of bacterial origin.

17. A process according to any one of claims 1 to 15, wherein said 2-hydroxy-3-oxoacid synthase comprises an enzyme chosen from yeast enzyme, fungal enzyme, and plant enzyme.

18. A process according to any one of claims 1 to 15, wherein said 2-hydroxy-3-oxoacid synthase comprises a wild type protein.

19. A process according to any one of claims 1 to 15, wherein said 2-hydroxy-3-oxoacid synthase comprises a recombinant protein.

20. A process according to any one of claims 1 to 15, wherein said 2-hydroxy-3-oxoacid synthase comprises an engineered protein.

21. A process according to any one of claims 1 to 15, wherein said 2-hydroxy-3-oxoacid synthase comprises a mutant protein.

22. A process according to any one of claims 1 to 15, wherein said 2-hydroxy-3-oxoacid synthase comprises an AHAS enzyme.

23. A process according to any one of claims 1 to 15, wherein said 2-hydroxy-3-oxoacid synthase comprises an TSAS enzyme.

24. A process according to any one of claims 1 to 15, wherein said 2-hydroxy-3-oxoacid synthase comprises AHAS isozyme I protein from *Escherichia coli.*

25. A process according to any one of claims 1 to 15, wherein said 2-hydroxy-3-oxoacid synthase comprises AHAS isozyme II protein from *Escherichia coli.*

26. A process according to any one of claims 1 to 15, wherein said 2-hydroxy-3-oxoacid synthase comprises TSAS from *Escherichia coli.*

27. A process according to any one of claims 1 to 15, wherein said 2-hydroxy-3-oxoacid synthase comprises a histidine-tagged protein.

28. A process according to any one of claims 1 to 15, wherein said 2-hydroxy-3-oxoacid synthase comprises specific directed mutants of AHAS II overexpressed in host cells.

29. A process according to any one of claims 1 to 25, wherein said 2-hydroxy-3-oxoacid synthase comprises a stabilized enzyme.

30. A process according to any one of claims 1 to 26, wherein said 2-hydroxy-3-oxoacid synthase comprises an immobilized enzyme.

31. A biotransformation process according to any one of claims 1 to 27, wherein all the components of the enzymatic reaction are added to the reaction mixture in one portion.

32. A biotransformation process according to any one of claims 1 to 27, wherein some of the components of the enzymatic reaction are added to the reaction mixture in more portions or continually.

33. A process according to claims 28 or 29, wherein pH of the mixture is from 5 to 9.

34. A process according to claims 28 or 29, wherein pH of the mixture is from 6.5 to 7.5.

35. A process according to claims 28 or 29, wherein the mixture comprises a buffer chosen from the group consisting of MES, BIS-TRIS, PIPES, BES, MOPS, TES, HEPES, TRIS, Tricine, Bicine, and phosphate.

36. A process according to claims 28 or 29, wherein the buffer has a concentration between 0.01 M and 0.25 M.

37. A process according to claims 28 or 29, wherein the aldehyde and the oxoacid are added to concentrations between 2 mM and 100 mM.

38. A process according to claims 28 or 29, wherein TPP and FAD are added to concentrations between 0.02 mM and 0.2 mM.

39. A process according to claims 28 or 29, wherein magnesium ions are added to a concentration between 0.2 mM and 2 mM.

40. A process according to claims 28 or 29, wherein DTT is added to a concentration between 0.1 mM and 2 mM.

41. A process according to claims 28 or 29, wherein the enzyme is added to a concentration between 0.01 mg/ml and 1.0 mg/ml.

42. A process according to claims 28 or 29, wherein the enzyme is added to a concentration between 0.1 and 10 U/ml.

43. A process according to claims 28 or 29, wherein the temperature of the mixture is between 15 and 40°C.

44. A process according to any one of claims 1 to 40, wherein said mixture comprises a water-miscible organic solvent chosen from 2-propanol, dimethyl sulfoxide, dimethyl formamide, and acetamide, in concentrations from 0 to 50% (v/v).